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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/387,164	08/31/1999	YONGJUN HU	303.607US1	2253

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EXAMINER

ROY, SIKHA

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 04/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/387,164

Applicant(s)

HU, YONGJUN

Examiner

Sikha Roy

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 February 2003.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☐ Claim(s) \_\_\_\_\_ is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

The Amendment, filed on February 11, 2003 has been entered and is acknowledged by the Examiner.

#### ***Specification***

The disclosure is objected to because of the following informalities:

The implantation layer conforming to the surface of the at least one emitter is only shown in the drawings but has not been explained in the specification.

Appropriate correction is required.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 3, 5,7,9,11,13 -15,17-19, 21,22,33-36 are rejected under 35 U.S.C. 102(e) as being anticipated by U. S. Patent 6,130,106 to Zimlich.

Regarding claim 3 Zimlich discloses (column 1 lines 39-48, column 2 lines 20-48) a field emission display comprising electron emitters having ion-implantation.

Implanting ions in an appropriate manner an emitter with a maximum desired current is

produced, the implantation lowering the potential and hence enhancing electron emission. This ion implantation layer (second ion-implantation step producing  $n^+$  type region) 38 lowers the work function and is conforming to the surface of the emitter (Fig. 3). The limitation reciting the implantation layer lowering the potential barrier is functionally inherent to the emitter.

Regarding claim 5 Zimlich discloses an emitter having implantation region, conforming to the surface of the emitter and lowering work function. The limitation reciting the implantation layer affecting a lowering mechanism to enhance the release of electrons is functionally inherent.

Regarding claim 7 the limitation reciting the implantation layer affecting the image force so as to enhance the releasing of electrons is functionally inherent to the emitter.

Regarding claim 9 Zimlich discloses the field emission display with emitters having an implantation. The limitation reciting the implantation layer enhancing the Schottky effect so as to enhance the releasing of electrons is functionally inherent to the emitter.

Regarding claim 11 Zimlich discloses the field emission display with emitters having an implantation layer. The limitation reciting the implantation layer decreasing the dielectric effect so as to enhance the releasing of electrons is functionally inherent to the emitter.

Claims 13 and 15 recite the same limitation as of claims 3 and 5 , the emitter having implantation layer (n-type silicon layer)38 (Fig. 3) in the tip of the emitters (column 2 lines 46,47)is conforming to the surface of the emitter. Regarding the

limitation comprising the implantation layer limits outgassing Zimlich discloses (column 1 lines 44-47) a next implantation step provides a more heavily doped n-type region where the tips of the emitters will be formed to reduce the work function with the effect of reducing outgassing.

Regarding claim 14 Zimlich discloses the ion implantation layer embedded in the surface of the emitter.

Claims 17, 19 and 21 essentially recite the same limitation as of claims 7, 9 and 11 respectively and hence are rejected for the same reasons.

Claims 18 and 22 recite the same limitation as of claim 14 and hence are rejected for the same reason.

Regarding claim 33 Zimlich discloses a field emission display device (Fig. 1, column 2 lines 1-15) comprising emitters 16 having ion implantation which produces current at a desired level, reduces potential barrier enhancing electron emission yielding maximum current and reduces work function and inhibits degradation by reducing outgassing. Zimlich further discloses a light-emitting target layer 26 that radiates when released electrons strike the light-emitting target.

Regarding claims 34 and 35 Zimlich discloses phosphor particles 28 over the pixel regions in the light-emitting target layer 26.

Regarding claim 36 Zimlich discloses (column 3 lines 9-25) knowing the maximum emission current, the maximum number of ions and hence maximum implantation in the emitter can be calculated and this emitter can be used in Video Graphics Array.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 4,6,8,10,12,16 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,130,106 to Zimlich.

Referring to claims 4,6, 8,10,12,16 and 20 Zimlich discloses the claimed invention except for the implantation layer being underneath the surface of the emitter. It would have been an obvious matter of design choice to have the implanted layer underneath the surface of the emitter as the Applicant has not disclosed that this solves any stated problem or is for any particular purpose and it appears that the invention would perform equally well with the implantation layer embedded in the surface of the emitter.

Claims 1,2,23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,130,106 to Zimlich in view of U. S. Patent 5,311,055 to Goodman et al.

Regarding claim 1 Zimlich discloses implantation by ions such as arsenic, antimony or phosphor. Zimlich does not disclose an implanted oxide layer.

Goodman et al. in pertinent art of semiconductor transistor emitters disclose (column 7 lines 7-30, Fig.5) a thin sacrificial oxygen implantation pattern is produced by implanting the emitter region with oxygen by well-known SIMOX process.

The selection of known material for a known purpose is generally considered to be within the skill of the art. It would have been obvious to one of ordinary skill in the art at the time of invention to use oxygen for ion implantation for the emitter of Zimlich as suggested by Goodman et al. for selection of known material for a known purpose is considered to be within the skill of the art.

Regarding claim 2 Zimlich discloses the implanted layer reduces work function and hence inhibits outgassing.

Referring to claims 23 and 24 Zimlich in view of Goodman et al. disclose oxygen ion implantation producing silicon oxide layer and releasing electrons at a predetermined energy level.

Claims 25 and 26 essentially recite the same limitation as of claim 23 and hence are rejected for the same reason (the embedded layer being same as implanted layer).

Claims 27-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U. S. Patent 6,130,106 to Zimlich in view of U. S. Patent 5,372,973 to Doan et al.

Regarding claim 27 Zimlich does not disclose an emitter having external coating on the embedded layer conforming to the surface of the emitter for releasing electrons.

Doan et al. in analogous art of cold cathode emitter tips disclose (column 6 lines 34-56) the cathode tips coated with a low work function material. It is further noted that

this external coating results in a sharper emitter tip with a lower work function and greater resistance to erosion.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the external coating of Doan et al. on the embedded layer of the emitter of Zimlich for a sharper emitter tip with a lower work function and greater resistance to erosion. The rest of the limitation is same as of claim 13 and hence is rejected for the same reason.

Claims 28 and 29 recite the same limitation as claims 3 and 5 and the limitation of external coating which has been disclosed by Zimlich and hence are rejected (see rejection of claims 3,5).

Claims 30,31 and 32 recite the same limitations as claims 7,9 and 11 respectively and the limitation of external coating as disclosed by Doan et al. and hence are rejected (see rejection of claims 7,9,11).

### ***Response to Arguments***

Applicant's arguments with respect to claims 1-35 have been considered but are not persuasive. In response to the argument that Zimlich discloses a device having structure different from the structures of the device of claim 3, the Examiner respectfully disagrees. The Examiner notes that the second ion implantation layer 38 lowering work function and enhancing electron emission in Fig. 3 is conforming to the surface of the emitter as claimed.



***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U. S. Patent 5,885,124 to Hattori discloses impurity ions such as oxygen and nitrogen, implanted underneath the tip of the emitter. U. S. Patent 6,232,705 to Forbes et al. discloses external coating of metal silicide formed on the poly-silicon emitters.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Art Unit: 2879

**Contact Information**

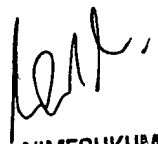
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (703) 308-2826. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (703) 305-4794. The fax phone number for the organization is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



Sikha Roy  
Patent Examiner  
Art Unit 2879



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